

Noise disturbs comfortable sleep.

A Comprehensive Literature Review of the Current State of the Sound Environment in a Neonatal Intensive Care Unit

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Background: Noise is a complex problem that is ubiquitous in NICU's environment. Although sound per se is not bad in itself and may even be advantageous, it is important to consider what sounds are difficult for preterm infants to process and where they come from?

Aims: In this study, we comprehensively reviewed the available literature on noise assessment indicators and noise countermeasures in NICUs.

Methods: Using the databases of PubMed, Google Scholar and the Japanese Medical Abstracts Society, we searched English and Japanese publications on noise assessment indicators and countermeasures, examined methods of analyzing sound environments, and the present status of noise countermeasures in NICUs.

RESULTS: Of the 148 articles included, 135 (91.2%) were studies on noise sources.

- Environmental factors
→ number of neonates, people, alarms, acuity level, and shift type.
- The frequency of noises : nursing activities, machine alarm sounds
- Different locations within the NICU

Noise sources
N=135

AAP recommends
<45dB
N=129

The American Academy of Pediatrics (AAP) recommends a maximum acceptable level of 45 decibels (dB)

- Sound frequency spectral analysis
- Loudness levels
+ sound frequencies

sound quality evaluation
N=13

- Below 100 Hz
- Incubator motor
- Incubator fan
- Vibration

Low Frequency Noise
N=13

- High-flow nasal cannula
- Continuous positive airway pressure
- High-frequency oscillatory ventilation

Associated with ventilators
N=19

Sound reduction management
N=92

- Earplugs or earmuffs
- Incubator covers
- Sound absorbing materials
- Staff training
- Sound-activated optical alarm devices

in an incubator
N=67

- Do Not Protect
- Running incubator (Giraffe Omnibed) was used
- Incubator engine, air fan

- A dosimeter (data logger)
- Sound-level meter
- Microphones
- A Smartphone Application

LA-7500 (Ono Sokki Co., Ltd.)



measuring
N=47

effects
N=60

- the adverse effects → undesirable physiologic and behavioral effects
- staff performance
- parents' satisfaction

Conclusion: The first step in implementing noise control is to measure and evaluate the sound environment. Since the increase or decrease in noise levels in the NICU tends to propagate in the incubator, it is necessary to appropriately identify noise sources that may affect preterm infants and to compare them with related factors.

Ethical considerations: This study was conducted with the approval of the Ethics Review Committee for Medical Research at Fujita Medical University, the institution to which the researchers belong (Accession No. HN22-110).

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